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SOUTHWEST FISHERIES CENTER

MONTHLY REPORT - NOVEMBER/DECEMBER 1978

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NOAA/NMFS

TO OUR READERS:

In the future, to cancel delivery of the Southwest Fisheries Center (SWFC) Monthly Report, or to change the delivery address, please notify by writing, Editor, Southwest Fisheries Center, P.O. Box 271, La Jolla, California 92038.

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SOUTHWEST FISHERIES CENTER
LA JOLLA, CALIFORNIA

HONOLULU LABORATORY
LA JOLLA LABORATORY
TIBURON LABORATORY
PACIFIC ENVIRONMENTAL GROUP

MONTHLY REPORT - NOVEMBER/DECEMBER 1978

STATUS OF PUBLICATIONS

Published

Barkley, Richard A., William H. Neill, and Reginald M. Gooding. 1978. Skipjack tuna, Katsuwonus pelamis, habitat based on temperature and oxygen requirements. Fish. Bull., U.S. 76(3): 653-662.

The habitat of skipjack tuna, Katsuwonus pelamis, has generally been assumed to be the warm surface layers of tropical and subtropical ocean, where most of these fish are seen and caught. But experiments with captive Hawaiian skipjack tuna imply that their habitat is more restricted, with boundaries defined by both temperature and dissolved oxygen. The lower temperature limit appears to be about 18° C. The upper temperature limit apparently varies with size of the fish, from 30° C or more for small individuals to as little as 20° C for the largest. Skipjack tuna also require water with unusually high concentrations of dissolved oxygen, at least 3.0-3.5 ml/liter (4-5 ppm), for long-term survival. If our Laboratory findings with captive skipjack tuna accurately define their natural habitat, only the smallest of these animals can inhabit the warm surface waters of the tropics; those larger than 4.5 kg must inhabit the thermocline. Our hypothesis, which can be tested, explains many features of the known distribution of skipjack tuna in the eastern and central Pacific Ocean.

This report does not constitute publication and is for information only.

Carr, John F. 1978. History of changes in fish species of the Great Lakes. Proceedings of the First and Second USA-USSR Symposia on the Effects of Pollutants Upon Aquatic Ecosystems, pp. 193-218.

Fielder, Paul C. 1978. The precision of simulated transect surveys of northern anchovy, Engraulis mordax, school groups. Fishery Bulletin, U.S. 76(3): 679-685.

Simulated transect surveys of model anchovy populations were compared in terms of precision and efficiency. The precision of systematic surveys varies inversely with the distance between transects. Systematic surveys give more precise population estimates than random surveys, due to the large positive correlation between closely spaced transects. The precision of stratified systematic surveys is not significantly different from that of the unstratified surveys when the school groups are randomly distributed in the survey area. However, stratified systematic surveys are more precise when the school groups are clumped in one end of the survey area. The results of the simulations show that the patchy distribution of anchovy schools can be a major source of error in population estimates.

Mendelssohn, Roy. 1978. Optimal harvesting strategies for stochastic single-species, multiage class models. Math. Biosci. 41: 159-174.

Qualitative properties of optimal harvesting policies for stochastic, single-species multiage class models are described. For many problems the k-dimensional problem (k is the number of age class) can be reduced to k one-dimensional problems, which can be solved far more readily. When such separability does not occur, bounds can be put on the derivatives of an optimal policy function which can greatly increase computational efficiency.

Approved by Center Director

Dizon, Andrew E., and Richard W. Brill. Thermoregulation in tunas. For publication in Am. Zool.

Eldridge, M.B., J.A. Whipple, D. Eng, M.J. Bowers, and B.M. Jarvis. Laboratory studies on factors affecting mortality in California striped bass (Morone saxatilis) eggs and larvae. (Presented at the 108th Annual Meeting of the American Fisheries Society, August 1978, to be published in the Proceedings).

Lenarz, W.H. and P.B. Adams. Some statistical consideration of the design of trawl surveys for rockfish. For publication in the Fishery Bulletin.

Mendelssohn, Roy. Determining the best tradeoff between expected economic return and the risk of undesirable events when managing a randomly varying population. For publication in J. Fish. Res. Board Can.

Stevenson, Merritt, James Squire, Jr., Charles Booth and Yoshimine Ikeda. Use of airborne sea surface temperature and chlorophyll measurements to monitor changes in a coastal fishing zone. For publication in the California Cooperative Oceanic Fisheries Investigations Reports.

Weihs, Daniel. Energetic significance in changes in swimming modes during growth of larval anchovy (Engraulis mordax). For publication in the Fishery Bulletin, U.S.

Vrooman, Andrew M., Pedro A. Paloma and James R. Zweifel. Subpopulations of northern anchovy, Engraulis mordax. For publication in California Fish and Game.

Zweifel, James R. Maximum likelihood estimates of the parameters of the linear, exponential and other functional relationships between the means of negative binomial distributions in which the effective element size may not be constant. For publication in Biometrika.

Zweifel, James and John R. Hunter. Temperature specific equations for growth and development of anchovy, Engraulis mordax, during embryonic and larval stages. For publication in the Fishery Bulletin, U.S.

HONOLULU LABORATORY

RESOURCE ASSESSMENT AND DEVELOPMENT INVESTIGATIONS (RADI)

Northwestern Hawaiian Islands (NWHI) Research Cruise Completed

The NOAA research vessel, Townsend Cromwell, returned to Honolulu on November 5 after completing a 3-week survey and assessment cruise (TC 78-04, Part I), to the Northwestern Hawaiian Islands (NWHI). Reginald M. Gooding, Chief Scientist on the cruise, reported that the survey was concentrated primarily on bottom fish and spiny lobster, Panulirus marginatus, in waters around Necker and Nihoa Islands, French Frigate Shoals, and Maro Reef.

Spiny lobster catch rates were highest at Necker and Maro Reef; handline catch rates for red and pink snappers, Etelis marshi and Pristipomoides filamentosus, sea bass Epinephelus quernus, and carangids were relatively good at Necker, French Frigate Shoals, and Maro Reef.

Extensive morphometric measurements on spiny lobsters were made during the cruise to obtain data needed for a study being conducted for the Spiny Lobster Planning Team of the Western Pacific Regional Fishery Management Council (WPRFMC). Researchers also collected 255 live lobsters for shoreside behavioral studies, tissue samples for ciguatoxin analysis, and the cephalothorax of lobsters for genetic studies.

In addition to Gooding, the scientific field party included Research Assistants Victor A. Honda, Robert L. Humphreys, Jr., Bert S. Kikkawa, and Darryl T. Tagami.

Work Continues on Northwestern Hawaiian Islands (NWHI) Research Projects

Richard Uchida, leader of the Survey of Insular Resources Task, reported that Task personnel continued work relating to various NWHI research projects. Uchida met with Dr. Y. Hokama and Clarence Minami, University of Hawaii, to discuss and formalize a contract proposal for the development of a simple enzyme-linked serological test for ciguatoxin. Uchida also continued analysis of spiny lobster morphometrics and catch-effort data.

Fishery Biologist James H. Uchiyama continued his study on the age and growth of the spiny lobster, P. marginatus. Using pueruli data collected during Townsend Cromwell cruise TC 78-03 as a starting point, and parameters determined earlier from examination of spiny lobster length-frequency modes, Uchiyama constructed a preliminary growth curve which agreed well with growth rates calculated by Hawaii Division of Fish and Game researchers. Research Assistant Robert B. Moffitt identified fish specimens and coded troll catches for keypunching.

Research Assistants Paul Shiota, Glenn Higashi, and Bert Kikkawa continued sorting plankton samples for copepods, fish eggs and larvae, and euphausiids for a NWHI ecosystem study. The sorted larval fish were turned over to Dr. Jed Hirota, University of Hawaii, who will be assuming the NWHI plankton ecosystem study.

In preparation for forthcoming NWHI cruises Shiota, Kikkawa, and Higashi began assembling and purchasing major gear items, including lobster pots and fish trawls and traps. Shiota also assumed the responsibility as project leader for the NWHI bottom trawling operation in the Insular Resources Task.

Research Assistant Darryl Tagami continued his work on the analysis of the size distribution of spiny lobsters by sex and geographical areas and worked with Research Assistants Victor Honda, Bert Kikkawa, and Robert Humphreys, Jr. in making spiny lobster morphometric measurements and fecundity determinations.

Gooding and Ito also made photographs of fishes to be included in the handbook of central and western Pacific fishes.

Economic Studies Continue on Kailua-Kona Charter Boat Fishery and Other Hawaiian Fisheries

During November, Dr. Michael F. Adams, Economist, and Gary L. Kamer, Statistician, have completed summarizing the final part of the Kailua-Kona troll fishery survey. This section of the summary includes a study on the customers of charter boats to find out how often they fish, how far they travel to fish, and how much they spend on necessary items, such as travel, hotels, fishing supplies. This survey will make it possible to estimate 1) the total revenue generated by the charter boats in the Kailua-Kona area, and 2) the importance of catch rates in influencing the total number of customers who come to Kailua-Kona.

In another sector of Hawaiian fisheries, Adams, Economist Linda Hudgins, and Research Assistant James Cooper developed concentration ratios for the fresh fish market in Hawaii during selected months. Their work is part of an ongoing effort to analyze several unique data sets of daily market records that have been provided to the Honolulu Laboratory by cooperating dealers in Hawaii. These records are valuable for developing fishery management plans. They also provide a basis for real-time analysis of the fish market in Hawaii that both the dealers and the fishermen will find useful in their decisionmaking.

Adams and his group also worked with the Southwest Region economist on the economic impact assessment for the Hawaiian monk seal critical habitat discussion paper.

Plans Made for Cooperative Study with National Institute of Health (NIH) Scientist

During November, Dr. Roy Mendelssohn, Operations Research Analyst, arranged a cooperative research effort with Dr. Edward J. Sondik of NIH. Sondik is an expert on partially observed Markov decision processes. The aim of this research is to analyze models that explicitly include the cost of research in the decisionmaking process. The cost of research is management consideration, since additional money to make estimates more precise in a model often yield little extra benefit in terms of increased long-run returns. This cooperative research effort will try to determine in what circumstances and with what effort the government should be willing to spend sizable amounts of money to increase the precision of a model.

Papers on Modelling to be Presented

Dr. Mendelssohn has been invited to present two papers at the upcoming joint National Meeting of the Operations Research Society of America/The Institute of Management Sciences, May 1979 in New Orleans.

These papers will detail the work being done on approximating larger models using smaller models and will also report the numerical results of analyzing Markov decision models for a variety of fisheries.

Fishery Management Research Continues

Dr. Jerry Wetherall, leader of the Fishery Management Research Task, reported that researchers in the Task continued working on various projects related to fishery management during December.

Fletcher Riggs, Fishery Biologist, completed computer programs which will be used in the analysis of tuna catch-and-effort statistics for the June 1979 tuna stock assessment workshop. Assessments will be made of major tuna stocks in the south, central, and western Pacific and in the Indian Ocean, excluding skipjack tuna.

Howard Yoshida, Fishery Biologist, completed the final revision of a proposal for a statewide fish-aggregating system. The proposal, prepared in cooperation with the State Division of Fish and Game, will be presented to the State Legislature for funding.

RESOURCE MONITORING AND ASSESSMENT

Recreational Fisheries Planning Meeting Held

Dr. Robert A. Skillman, leader of the Resource Monitoring and Assessment Group, reports that several Honolulu Laboratory staff members participated in an initial planning session for the development of a Laboratory Marine Recreational Fisheries Plan. The recreational fisheries situation in the central and western Pacific was discussed relative to the role of Honolulu Laboratory in supporting fisheries development, in obtaining biological knowledge of the stocks involved, and in assessing stocks for management purposes. Future meetings will be scheduled to continue the planning process.

Plans Made for Site Review of the Northwestern Hawaiian Islands by State of Hawaii Policymakers

The Hawaii Division of Fish and Game, U.S. Fish and Wildlife Service, and Honolulu Laboratory cooperated in the development of plans for a cruise to the NWHI to allow policymaking state legislators and department heads to become more familiar with the resource situation there. The Base Commander, Midway Islands Naval Base, was also involved in the preparations. Skillman reports that the cruise was scheduled for December 1978; however, engine problems on the Townsend Cromwell has forced the rescheduling of this cruise to the spring of 1979.

Estimated 1978 Hawaii Skipjack Tuna Landings Below Long-Term Average

The November 1978 Hawaii landings of skipjack tuna were estimated at 240.3 metric tons (MT), which is 133.1 MT above the landings in November 1977 and 73.7 MT above the 1948-77 long-term average for the month of November.

The December 1978 Hawaii landings of skipjack tuna were estimated at 61.5 MT, which is 96.2 MT below the landings in December 1977 and 66.9 MT below the 1948-77 long-term average for December. The cumulative landings from January through December were estimated at 2,979.9 MT, which is 535.7 MT below last year's landings and 871.5 MT below the 1948-77 long-term annual average.

FISH-ENVIRONMENT INVESTIGATIONS

Specimens from Billfish Tournament Analyzed

Research Assistant Robert Humphreys prepared micro-sections of blue marlin dorsal spines collected at the 1978 Hawaiian International Billfish Tournament for age analysis. He also examined the stomach contents of *Coryphaena hippurus* and *C. equiselis*.

Burnt Tuna Study Continues

The condition of raw tuna wherein the flesh is opaque, light in color, and has a sour taste is referred to in Hawaii as "burnt" and in Japan as "yake." Tuna flesh in this condition is satisfactory for cooking, smoking or canning but is not desirable as "sashimi" and therefore does not command a premium price.

Burnt tuna occurs most frequently during the summer and in areas where fish are caught in relatively shallow water (0-10 fathoms). Various techniques of chilling and bleeding the fish after capture have had no obvious effect on decreasing this condition.

The flesh of burnt tuna appears to be similar to pale soft exudative pork (PSE). In both conditions the muscle is pale and soft compared to normal muscle. PSE in susceptible pigs is induced by stress which results in a malignant hyperthermia (elevated temperature), increased CPK, and increased acidity of the muscle.

Dr. Jean Cramer, under contract with the Honolulu Laboratory, has been conducting a study during the past 6 months to determine if stress during catching is a significant factor in the production of the burnt tuna condition. Body temperature data and blood and muscle samples were collected from yellowfin and bigeye tunas immediately after catching.

Additional tissue samples were collected at regular intervals after death. All blood and muscle samples have been analyzed for acidity, glucose, and lactic acid. Blood serum will be analyzed for CPK content.

So far the data support the hypothesis that burnt tuna is related to stress. Blood lactate and tissue acidity at death were higher in burnt tuna than in normal tuna.

Manuscript on Hawaiian Ika-Shibi Fishery Completed

Heeny S. H. Yuen, Fishery Biologist, reported the completion of the first draft of a manuscript describing the Hawaiian ika-shibi fishery. The term "ika-shibi," which has its origin from the Japanese language and literally translates to "squid-tuna," was coined to describe a fishery which uses handlines and squid as bait to catch tunas at night.

Night handline fishing effectively catches tunas in small localized areas. The ika-shibi fishery started in Hilo, Hawaii, and experienced a rapid growth when high prices on the fresh tuna market and fast air delivery to distant cities opened new markets. The simplicity of the method and low cost of equipment makes it a promising method for other island cultures of low technology to use in developing a fishery. The paper describes the fishing method and gear in detail.

LA JOLLA LABORATORY

Coastal Fisheries Resources Division

LARVAL FISHES, COASTAL EAST PACIFIC

Incidence of Cannibalism in the Northern Anchovy Estimated

The extent of cannibalism of adult anchovy on their young was estimated by Fishery Biologist J. Hunter assisted by C. Kimbrell from examination of 28 sets of stomach samples, of 10 or more fish each. Samples were taken at night in the Southern California Bight during the peak of the anchovy breeding season.

The mean stomach volume of the fish sampled was 23% of the volume of a full stomach. Stomach volumes did not change with time of day indicating that the fish fed throughout the night. Nearly all stomachs contained greenish to brownish material, presumably phytoplankton remains. Somewhat less frequently copepods and euphausiids were mixed with this material.

Larval fishes occurred in only 7 of the 309 stomachs (2%), and only 1 stomach contained larvae that could be identified as anchovy. This stomach contained 21 relatively large anchovy larvae; the only measurable specimen was about 17 mm standard length. Anchovy eggs occurred much more frequently; on the average, 42% of the stomachs contained anchovy eggs, and the mean number of eggs per stomach, including stomachs which contained no eggs, was 4.4 $\pm$ 3.4 eggs. The maximum number of eggs in a single stomach was 730; these eggs were undigested suggesting feeding occurred at about the time of collection (0210 hours).

The distribution of the number of eggs consumed per fish was highly skewed; about 90% of the eggs occurred in only 29% of the positive stomach samples (13% of all stomachs). The patchiness of anchovy eggs in the sea probably is responsible for the skewed distribution, as the distribution is not greatly different from the one observed for eggs taken in plankton tows.

The number of eggs consumed by anchovy increased exponentially with the density of anchovy eggs in the sea; it increased from 0.15 eggs at a density of 10 egg m^{-3} to 30 eggs at 100 eggs m^{-3}. Plankton tows provided only a relative measure of the egg density encountered by filtering anchovy, however. Anchovy do not begin to filter until the density is above 1,000 eggs m^{-3}; the highest density encountered, 222 eggs m^{-3}, was an order of magnitude below the threshold for the onset of filtering. Thus, differences in egg density among plankton tows and the correlated changes in egg consumption, are probably a function of the frequency and size of egg patches in the sea.

The nightly ration of eggs consumed was estimated from the equation $F = r * \bar{c} * t$ (Stauffer, SWFC, unpublished MS), where F = ration, r = rate of gastric evacuation of eggs (0.701), $\bar{c}$ = mean stomach contents (4.4 eggs), and t = the duration of feeding (12 hours). The mean nightly ration over 12 hours was 37.4 eggs per fish per night.

The simpliest method of evaluating the potential effect of egg consumption is to relate the nightly ration (37.4 eggs/ fish) to the nightly egg production. Anchovy produce 368 eggs per gram of female per spawning and during peak breeding periods about 16% of the females spawn each night (Hunter and Goldberg, in press). Thus, 0.16 (368) or 58.9 eggs are produced per gram of female in a school per night; assuming the sex ratio to be 1:1, 29.4 eggs are produced per gram of fish in the school, regardless of sex. The mean weight of fish in this study was 17.5 g, giving a nightly ration of eggs consumed and a weight basis of 2.1 eggs/gram. The ratio of egg ration to egg production per night on a weight basis was 0.073. According to these calculations, about 7% of the nightly production of eggs in a school were consumed per night.

These calculations were restricted to a 12-hour night because our collections were taken only at night. Although spawning occurs only at night, feeding occurs throughout the day, hence the proportion of egg production consumed on a daily basis may be 14%. Zweifel (SWFC, unpublished) estimated natural mortality of anchovy eggs to be on the order of 25% per day. Thus, about 50% of the natural egg mortality may be accounted for by egg cannibalism.

Manuscript on Eddies of the California Current System Revised

Dr. Robert Owen, Oceanographer, revised and added to his manuscript, "Free and Stationary Eddies of the California Current System", in November. The paper reviews the incidence and ecological effects of eddies defined by baroclinic flow off the Californias and forms a basis for closer examination of eddy systems and their effects on survival and recruitment to fisheries of young anchovy and other species. The Southern California Eddy is defined and receives special attention because it is the most resolvable and easily studied eddy in the system.

Of particular interest is an analysis demonstrating the preponderance of cyclonic over anticyclonic eddies above 100 km diameter in the California Current System. Clyclonic eddies have the property of enriching the surface layer by nutrient injection from below. Hence, conversion of energy of the flow to organic food is more efficient where cyclonic eddies occur. The predominance of this eddy type is indicated to be the result of lateral friction in the flow produced by wind and by the coastal boundary. Evidence assembled from the literature shows that the Southern California Eddy is likely comparable in enrichment effect to other large Pacific eddies, and to upwelling along a comparable length of the California coastline.

The manuscript will shortly be sent for outside reviews.

Models Developed for Estimating Preservation Shrinkage of Anchovy Larvae

In larval fish studies relating laboratory results to the field, larvae that are compared must be at the same stage of development. Most field and laboratory studies rely on length measurements of preserved larval fish to describe life stages.

Fishery Biologist Gail Theilacker has been studying the shrinkage of field-caught and laboratory-reared anchovy larvae in preservative. Theilacker's results in past studies suggest that morphological differences that have been reported between laboratory-reared and sea-caught larvae of the same length may be the result of the method of handling larvae prior to preservation: larvae that are pipetted directly into preservative shrink less than larvae that are netted before preservation.

The captains of the chartered jigboats also tagged albacore. Four hundred and ninety-two albacore were tagged which makes a total of 802 albacore tagged by U.S. boats in the central North Pacific since 1975.

R. Nishimoto, Fishery Biologist, and Eric Hargrove, student intern from San Diego State University, are processing the albacore catch, effort, and tagging data from these vessels. Nishimoto and Hargrove have also been summarizing fishing, oceanographic and tagging data from four jigboats which scouted for albacore off the U.S. west coast from October 16 to November 14. These boats were on charter to the American Fishermen's Research Foundation (AFRF) to investigate the migration patterns of albacore as they emigrate from waters off California at the end of the traditional fishing season. A secondary objective is to evaluate whether the North American albacore fishery can be extended by boats fishing in the offshore waters of California in late season. Results from the 1978 survey did not indicate large concentrates of albacore in the area of operstions between 33-42°N latitude and westward to 135°W longitude. However, albacore were found in small numbers in most of the areas fished. A total of 290 albacore were tagged and released during the late-season study.

Results of Albacore Research Presented to Fishermen

Dr. Michael Laurs, leader of the Albacore Fishery Investigation, gave presentations on albacore research results to the Western Fishboat Owners Association Board of Directors meeting on December 13 and to the general membership meeting on December 14. Laurs' presentations included the results of tagging and tetracycline injection operations conducted by National Marine Fisheries Service researchers on board commercial fishing boats chartered by the American Fishermen's Research Foundation. (See September monthly report for more details on research.)

In his presentations, Laurs discussed the following topics: information on albacore migration patterns and stock structure, results of the tetracycline injection/otolith growth study, information obtained from post-fishing-season scouting by the chartered vessel and investigation of migration routes followed by the southern group of albacore at the end of the seasonal fishery, and the results of exploratory jig fishing and tagging in the eastern North Pacific.

Both presentations were well-received; a total of about 120 fishermen attended the meetings.

In his presentation, Lynn described the mesocale structure of the subtropic and subarctic fronts and the intervening Transition Zone waters. Meanders with length scales on the order of 100 to 300 nautical miles have been observed in salinity field distributions. Lynn discussed the year-to-year variability in the fronts and covered, in detail, the small scale structure about the fronts, including interleaving of water masses and geostrophic currents.

The organizers of the meeting, Drs. Niiler and Paulson, have planned a pilot study cruise to examine the subtropic front in the vicinity of 155° W during January 1980. They anticipate that broader-based studies will follow-up on information gathered on the cruise. Dr. G. Roden of the University of Washington is planning related research on ocean fronts in the North Pacific. Other researchers are encouraged to submit ideas and proposals, especially ones involving another vessel to work with Oregon State University's research vessel, the Acona.

ALBACORE FISHERIES

Data Collected on Albacore in the Western Pacific

Four U.S. commercial jigboats conducted exploratory jig-fishing for albacore tuna in the western Pacific in areas north of Midway Island between May and August 1978. These jigboats were chartered by the Pacific Tuna Development Foundation (PTDF) to scout for albacore in the central North Pacific in areas where, since 1975, chartered U.S. jigboats have found good signs of albacore during the summer months. All boats were outfitted with expendable bathythermograph recorders (XBT), facsimile recorders, dart tags, and fishing and weather observation logs supplied by the Albacore Fisheries Program at the SWFC.

The four boats left from three locations. One vessel left from San Diego in early May and found small quantities of albacore from San Diego to north of Hawaii along 33° N latitude; two boats left from Honolulu in mid-May and one left from Seward, Alaska in early June. Fair to excellent catches were made by these boats between 34°-42°30'N latitude, 172°W-177°E longitude between the last week of May to mid-August. As the summer progressed, the boats moved northwesterly from the southeast corner of this area and there were numerous days when each jigboat caught between 100-300 fish a day. The best catch for a single day by one boat was approximately 750 fish. The average albacore size during periods of good catches were 6.4-8.2 kg/albacore. Total landings by the four jigboats were about 280 tons.

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Testing and Modification of Conductivity/Temperature/Depth Microprocessor System Continues

During December, Lt. M. Sullivan of the NOAA Corps continued testing and modifying the software of the Conductivity/Temperature/Depth microprocessor system, an oceanographic profiler with a microprocessor for data collection, processing, and display. Sullivan, who is overseeing the scheduling, maintenance, contract, and calibration requirements of the system, is presently experimenting with designs for specialized data collection/processing routines for examining fine-structure in the water column. His experiments will reveal the limits imposed by the sensors and indeterminants in their various time-response characteristics. These specialized routines will be useful in examining fine-scale stratification of temperature and density that is important in larval fish survival studies.

Sullivan also trained sea-going technicians in the operation of the system, using a method of simulating an oceanographic cast.

Results of Albacore Research Presented in Europe

Dr. Michael Laurs, leader of the Albacore Fisheries Program, made a presentation at an oceanic fronts symposium held in Brest, France on November 13-18, sponsored by the 14th General Meeting of the Scientific Committee on Oceanic Research, International Council of Scientific Unione. Laurs was one of eight speakers invited to the international meeting.

Laurs' presentation was entitled, "The influence of open ocean and coastal upwelling fronts on the migration, distribution, and relative abundances of albacore tuna (Thunnus alalunga) in the Eastern North Pacific." The talk included results of his research and discussion of the role of coastal-upwelling fronts on lower trophic biota.

Proceedings of the symposium are to be published by Pergamon Press with Dr. John Woods, Institur für Meereskunde, University of Kiel, Kiel, Germany, serving as the editor.

Laurs also met with French fishery scientists at the Centre National Pour l'Exploitation des Oceans in Brest and gave a seminar on the results of albacore research carried on at the SWFC.

On his way to France, Laurs met with L. Oswald at the University of Stirling in Stirling, Scotland to discuss Oswald's recent innovative research on injection anesthesia in fish. Many of Oswald's findings appear to be applicable to studies of the physiology and biochemistry of albacore and other tuna.

MULTISPECIES TAXONOMY PROGRAM

CalCOFI Larval Fish Data Processed

During December, major progress was made toward the computer processing of unsized larval fish data obtained on the CalCOFI cruises. Edit programs for the unsized data and the net tow data were completed; all of the 1975 larval data was loaded onto the INFONET data base system and is through the first level edit. Computer Programmer Oden Burris has nearly completed the transfer of the 1975 station and net tow data from the Burroughs data base system to INFONET. This transfer will allow the two data sets to be matched.

To improve data entry and recovery, Dr. H.G. Moser, leader of the Multispecies Taxonomy Program, has been working with Dr. P. Smith, leader of the Survey Systems Development and Evaluation Program, on the development of a hierarchical code list for fish larvae in the CalCOFI region. Plankton identifiers will use this code list to enter larval fish data directly into the data base through a laboratory terminal. Statistical Aid Rich Charter has been working on a master code table that incorporates the new hierarchical code and the presently-used numerical code.

Laboratory-raised Blennies Spawn Successfully

During December, researchers in the larvae rearing project collected new data on the spawning of the mussel blenny (Hyposoblennius jenkensi) when parent fishes reared in La Jolla Laboratory's aquarium spawned successfully.

Dr. David Leighton of San Diego State University provided the laboratory with a batch of eggs of the mussel blenny on July 14, 1978. The eggs, which were attached to the valve of a rock scallop and guarded by the male parent, began to hatch on July 16. The larvae were reared on Brachionus and brine shrimp and four of them reached adulthood.

On December 4, 1978, one of the females laid a batch of eggs on the side of the aquarium. The eggs were guarded by the male parent and began to hatch on December 24.

Information on the time to sexual maturity and the egg incubation time of the blenny will be included in a paper being prepared by Biological Technician Betsy Stevens on the early life history of this species.

Work Continues in Rockfish Larvae Identification

Since August of 1977, the Multispecies Taxonomy Group at the La Jolla Laboratory has been rearing larvae from wild-caught eggs. The goal of this project has been the identification of previously unidentified eggs found in the CalCOFI collections.

During December, larvae of the blue rockfish (Sebastes mystinus) were obtained from a pregnant female caught off San Clemente Island on December 16. The larvae were reared for one week on wild plankton, during which time they developed a specific pattern of melanophores which will aid in the identification of the species from CalCOFI plankton samples.

Also during December, Elaine Sandknop, Biological Technician, with the assistance of Biological Aid Susan D'Vincent and Student Assistant Connie Fey, completed a project on the identification of four species of rockfishes from historical CalCOFI plankton samples. The data were turned over to Fishery Biologist John McGregor, who will use them in population estimation of the four species.

Textbook Chapter Completed

Dr. E. Ahlstrom, Senior Scientist for the Coastal Fisheries Resources Division, completed a first draft of the chapter on flatfishes in a text which he is writing with Dr. G. Moser on the eggs and larvae of marine fishes. The chapter summarizes what is known about the early life history of six families of flatfishes and presents new information and an analysis of phylogenetic relationships within the flatfishes.

MULTISPECIES, COASTAL EAST PACIFIC (CalCOFI) PROGRAM

Cooperative Research with Foreign Nationals Inside U.S. 200-mile Fishery Zone Planned

Two research cruises for assessment of fishery resources within our 200-mile fishery conservation zone are being planned with the Soviet Union and Spain.

The first cruise is the 9th in a series of annual U.S.-Soviet ichthyoplankton surveys to monitor the spawning of Pacific hake. This year's survey will also serve as the second cruise of the anchovy egg and larva survey for estimating anchovy spawning biomass on which the 1979-80 anchovy quota will be based. The Soviet research vessel, Tikhookeansky, will arrive in Long Beach on February 4 for the 30-day survey. This cruise also is being coordinated with Instituto Nacional de Pesca in Mexico.

The second survey will be a joint research cruise in cooperation with the Spanish Institute for Fisheries Investigations in February and March 1979. The purpose of the cruise is to survey coastal California waters from the Mexican border to 39°N from 12 to 200 miles offshore for the occurrence of squid species, particularly Loligo opalescens, and to estimate the density, size composition, sexual maturity and sex ratio of the squid populations. The by-catch and effectiveness of various trawls will also be evaluated.

The Spanish research vessel will be a 500-ton-capacity, commercial stern-trawler/factory ship supplied by a Spanish fisheries cooperative in Vigo, Spain. Scientific personnel will include two cephalopod experts from the Spanish Institute for Fisheries Investigations and two U.S. scientists. The Spanish scientists will fly to San Diego in late January to prepare the final details of the cruise plan with Center scientists. The ship will arrive in San Diego in early February to begin the survey and will end the survey with a port call in Eureka. Visitors will be welcome to tour the vessel.

COMMERCIAL AND RECREATIONAL FISHERIES RESEARCH FOR MANAGEMENT

Partyboat Passenger Survey

Progress on the partyboat survey was reported in November by the contractor, Center for Natural Areas, Inc. Phase one of the survey has been completed; a total of 529 questionnaires have been filled out by passengers on partyboats. This total is far below the desired level. Response rates on board partyboats have averaged only 35%. Response rate on the follow-up telephone interviews was better than 80%.

The response rate depends upon the active interest of the landing operators, vessel owners, and especially the skippers and crews. Some vessels had zero response because the skipper and crew were too busy to administer the survey. One vessel lost the completed forms.

Data coding, keypunching and creation of computer files for the survey has progressed very well. The contractor displayed the results of a large number of sorts and summary statistical tabulations. A Statistical Package for Social Sciences file has been created, and will be provided to SWFC along with the analysis.

SURVEY SYSTEMS DEVELOPMENT AND EVALUATION

Collaborative Effort to Study Associations and Abundance of Fish Species Off the California Coast Begins

Under the guidance of Dr. Paul Smith, leader of the Survey Systems Development and Evaluation Program, and Dr. Geoffrey Moser, leader of the Multispecies Taxonomy Program, and UCSD biology student Cynthia Haight is producing species-time series for 11 groups of fish larvae, charting the abundance of these species off of Southern California during the month of April over the years of the CalCOFI cruises, from 1957 to 1969.

The ultimate goals of this new collaborative effort by Smith and Moser are: 1) to define the species associations of the fishes in the California Current System; 2) to associate the changes in species composition with changes in the environment; and 3) to relate changes in the species composition and abundance to the distribution, abundance, and mortality rate of the larvae of commercial species such as the northern anchovy.

The first step toward accomplishing these goals will be to make all data on identified fish larvae available through a computer for rapid and accurate data assembly. Rich Charter and the Automatic Data Processing section will be producing a data base this year; Haight's results will be used to verify the data base.

CalCOFI Data File Updated

In preparation for construction of a new set of mean vertical sections of oceanographic properties in the CalCOFI survey regions, Oceanographer L. Eber has continued debugging and tuning revised versions of his grid-analysis and contouring programs. In addition, he completed two utility programs to operate on files containing specific sets of data selected for grid analysis. One of these is a fast-sort routine designed to reorder CalCOFI records by station code when multiple cruises are to be combined in one analysis. The other is an interactive edit routine designed to facilitate correcting or deleting data values in the binary records prior to analysis.

The updating of the CalCOFI oceanographic data file with data from 1978 cruises is continuing as the data become available from Scripps' Institution of Oceanography Data Collection and Processing Group. Data through May have been received to date.

Oceanic Fisheries Resources Division

TUNA RESOURCES PROGRAM

Scientists Attend ICCAT Meetings

The first special meeting of the International Commission for the Conservation of Atlantic Tunas (ICCAT) was held in Madrid, Spain, November 6-21. The special meeting was called to discuss business matters and the increasingly complex issues facing the Commission.

The Standing Committee on Research and Statistics (SCRS) of the Commission met from November 6-15. SWFC scientists attending that meeting were I. Barrett, Center; Dr. G. Sakagawa, leader of the Tuna Resources Program; Dr. N. Bartoo, Fishery Biologist; R. Rinaldo, Fishery Biologist; and heading the U.S. scientific delegation, Dr. W. Fox, newly appointed Director of the Southeast Fisheries Center.

Scientists from 12 of the 18 member countries attended the SCRS meeting, reviewed 106 documents, and used the information to determine the current status of tuna and billfish stocks in the Atlantic.

The SCRS found that yellowfin tuna stocks were heavily fished, particularly in the eastern Atlantic Ocean where recent catch increases resulted from offshore expansion of the fishing area. The result of further geographic expansion is uncertain, but future catch levels will be influenced by mortality of small yellowfin tuna, which currently appears to be high. The SCRS recommended firm application of the 3.2 kg minimum size regulation.

The SCRS judged that skipjack tuna stocks had a larger potential catch than the record high of 118,000 MT obtained in 1977, although the status of the stocks is not clear.

Bluefin tuna stocks were found to be at low abundance levels. Stock abundance had been decreasing and now appears to be stabilized with a low recruitment. The SCRS expects an increase in the mortality of medium to large fish, if the catch remains high. The scientists recommended that current regulations establishing a 6.4 kg minimum size and restricting fishing mortality to 1974-75 levels be maintained.

The SCRS found that the south Atlantic albacore stock was harvested at about maximum sustainable yield, but that the north Atlantic albacore stock was overfished. Recruitment to the north Atlantic fishery is quite variable and is presently at about 20 to 25% of the 1957 level. The SCRS recommended that the Commission prepare to adopt strong management measures if analyses in 1979 should indicate a need to increase the north Atlantic albacore spawning stock.

Bigeye tuna stocks were found to be in good condition. The SCRS noted a large number of small bigeye tuna were being caught and recommended that a 3.2 kg minimum size regulation be adopted. The scientists considered that such a regulation would also solve the problem of undersized yellowfin tuna being landed and reported as bigeye tuna.

The SCRS found that white marlin stocks were harvested near maximum sustainable yield levels, while the blue marlin stocks were being overfished. The SCRS recommended that the Commission prepare to adopt management measures if continued analysis showed that either species was overfished.

The scientists also approved a detailed proposal for an ICCAT International Skipjack Year Program. The Program is a coordinated, Atlantic-wide research effort investigating the population biology of skipjack tuna. The objective of the program is to obtain information on the population biology of the stocks in order to develop more precise management advice for the Commission. A bluefin tuna workshop for 1979 was also approved by the SCRS.

Barrett and Sakagawa attended the Commission meeting, November 15-21, serving as scientific advisors to United States ICCAT Commissioners C. Blondin, H. Cary, and F. Carlton. Representatives of 16 of the 18 ICCAT member countries attended the Commission meeting. The representatives endorsed the International Skipjack Year Program and adopted the first year's budget. A 3.2 kg minimum size regulation on bigeye tuna was adopted to complement the current 3.2 kg minimum size regulation on yellowfin tuna. No new bluefin tuna regulations were adopted, but a proposal to establish separate east and west management units was discussed. The special meeting closed with an agreement that the Sixth Regular Meeting of the Commission would be held in Madrid, Spain during November 14-21, 1979.

Swordfish Observer Program Completed

The swordfish observer program, which began on August 25, 1978, ceased collecting data in late November. During the four-month program, observers made seven trips aboard cooperating swordfish vessels and sampled a total of 92 swordfish for morphometric and biological data. Data collection is expected to resume next spring.

The swordfish that were sampled averaged 251 pounds, with a range in weight from 137 to 436 pounds. The sex ratio of females to males was 1.7 to 1. A more complete analysis of the data will be presented in a future report.

Swordfish landings in California are expected to reach a record high in 1978. California Department of Fish and Game reports based on landing receipts indicate that over 1,900,000 pounds (over 12,500 fish) have been landed this year as of November 28. This total already exceeds the previous record high annual catch of 1,113,800 pounds, made in the year 1948.

Data Collected in Swordfish Tagging Program

In late August, a swordfish harpoon tagging program was initiated as a part of the Cooperative Marine Game Fish Tagging Program, with the cooperation of representatives of the International Gamefish Association.

Using tags furnished by the SWFC, marine anglers have tagged a total of 15 swordfish off southern California from late August through October. Of the 15, six tags have been recovered by commercial fishermen, a 40% recovery rate. Recoveries were made in the same general area as the fish were tagged, with times-at-sea of one to 30 days. Distances from tag to recapture point range from less than five miles to about 30 miles.

Preliminary results from this limited amount of tagging indicated that within the area of intensive fishing, a possible high exploitation rate exists for swordfish observed at the surface.

Tuna Fisheries Economist Evaluates
Alternative Management Approaches

Dr. Dennis M. King, Fishery Economist, has completed an Administrative Report entitled "An economic evaluation of alternative international arrangements for managing highly migratory species: exclusive vs. non-exclusive national fishing rights in the east Pacific tuna fishery." The paper outlines some of the economic inefficiencies of the existing international management regime which has evolved in the fishery under the Inter-American Tropical Tuna Commission (IATTC). The paper also examines two management alternatives that have been proposed to replace the current approach.

The most well-known of the two alternative management systems is a Partially Allocated Quota (PAQ) system, a variation of the existing IATTC system. The PAQ system calls for a "centrally-controlled market solution" to the international management problems that have developed in the fishery. The second alternative is a Quota Certificate (QC) system which is similar to the PAQ system except that it prescribes a "decentralized market solution" to international management problems in the fishery. King compares the PAQ and QC systems and reaches conclusions that suggest that a decentralized market solution is feasible in the eastern Pacific tuna

fishery and that it is superior to a centrally-controlled market solution in terms of conservation, economic efficiency, long-run stability, flexibility, and the overall level of international economic welfare.

Sampling of Tuna Catches from U.S. Purse Seiners in the Atlantic Continues

Eighteen U.S. tuna purse seiners from the eastern Pacific fleet spent part of the year fishing in the Atlantic Ocean. All vessels returned to port by the end of the year. The Inter-American Tropical Tuna Commission estimates that the total catch of yellowfin, bigeye, and skipjack tunas by these vessels to date is 19,000 metric tons. Most of the catches were made in the eastern tropical Atlantic, although significant amounts of yellowfin and skipjack tunas were caught in the Caribbean Sea in November and October.

From January 1 to December 1, the catches of 12 vessels were sampled for length-frequency and species composition; 3,719 tunas were measured for length-frequency. Yellowfin and bigeye tunas sampled from catches made in the eastern tropical Atlantic ranged in fork length from 45 cm to 170 cm. The smaller yellowfin and bigeye tunas (45 to 100 cm) were generally caught in the nearshore areas in the Gulf of Guinea; the larger fish were caught farther offshore. Skipjack tuna ranged in fork length from 35 to 60 cm. Sample data indicates that catches from the Caribbean Sea were comprised of larger fish than those from the eastern tropical Atlantic. Yellowfin tuna were generally in the 100 to 170 cm range. Some skipjack tuna exceeded 70 cm in fork length.

Biological Sampling of Foreign Imports of Atlantic Tunas Continues in Puerto Rico

Atlantic-caught tunas transshipped to Puerto Rico have been sampled routinely for biological information by Technician Eugene Holzapfel of the La Jolla Laboratory since March 1975. Data on fork length, weight, and species composition are collected.

Fishery Biologist James Renner, who monitors this sampling in La Jolla, reports that the number of samples increased over the 108 collected in 1977. Eighteen percent more fish were sampled this year when 4,967 fish were sampled. The tonnage sampled increased over the 7,934 MT sampled in 1977.

Results of sampling for the year January through December 1978 are as follows:

Species	Gear	No. of Samples	No. of Fish Sampled	Tonnage Sampled (MT)
Yellowfin	Baitboat	37	1987	1068
	Purse Seine	7	331	418
Skipjack	Baitboat	22	1202	5212
	Purse Seine	16	817	5587
	Unknown	1	50	5
Bigeye	Baitboat	32	1383	571
	Purse Seine	5	181	249
Albacore	Longline	2	100	662
TOTAL		122	6051	13772

Tuna Vessel Participation in FAX Advisory Program

During November 1978, 16 tuna seiners and 2 research vessels contributed synoptic weather and expendable bathythermograph (XBT) data to the NMFS FAX advisory program. During December 1978, 8 tuna seiners and 1 research vessel contributed data. The number of observations reported in November and December of this year are compared to the number of observations in previous years in the tables below:

	NOVEMBER			
	1975	1976	1977	1978
Number of vessels with equipment	76	67	54	48
Number of vessels reporting	20	11	16	18
Number of weather observations reported	152	123	235	157
Number of XBT observations reported	24	2	22	9
Total observations	176	125	257	166

	DECEMBER 1975	1976	1977	1978
Number of vessels with equipment	67	58	54	47
Number of vessels reporting	2	3	11	9
Number of weather observations reported	4	10	58	68
Number of XBT observations reported	1	0	7	3
Total observations	5	10	65	71

Leading all program participants in both years were Captain John Gomes and the crew of the tuna seiner Santa Rosa with 24 weather observations and 2 XBT observations. We extend our thanks to these and all other contributing participants.

FAX Program Summary

Fifty-four vessels participated in the FAX Program during 1978, the lowest number of participants since the program began in 1971. Despite the decrease in participants, 2106 weather observations were collected in 1978, the highest total since 1976 when 2,259 weather observations were received with 74 vessels participating in the program. The program received a total of 265 XBT observations; the most since 1975 when 545 XBT observations were received, with 76 vessels participating in the program.

The leading contributor for the third consecutive year was the purse seiner Santa Rosa which submitted 299 weather observations and 46 XBT observations. Other outstanding contributors during 1978 were the Cheryl Marie with 229 total observations, the Sea Treasure with 154 total observations, the Consho with 119 total observations, and the Claire P with 116 total observations.

MARINE MAMMAL BIOLOGY AND TECHNOLOGY PROGRAM

NWAFC Personnel Trained

During November, the staff of the Marine Mammal Biology and Technology Program at the La Jolla Laboratory held a two-week training program for four staff members of the Northwest and Alaskan Fisheries Center (NWAFC) who are involved in processing Dalls porpoise killed in the Northwest salmon gill net fishery. The trainees dissected porpoises,

sorted and analyzed reproductive tract samples, and learned the techniques needed to determine the ages of dolphins. The course was designed to establish a uniform method of collecting specimen data between the SWFC and the NWAFC.

Queen Mary Departs on Final Cruise

The dedicated vessel, Queen Mary, departed San Diego on November 11 for its fifth and last research cruise of the year, and returned on December 10.

During the first leg of the 30-day cruise, researchers from the SWFC and the Tuna/Porpoise Management Branch of NMFS, led by Chief Scientist D. Holts, took interior net measurements during various phases of the fishing operation. These data will later be used to determine the parameters in an interactive computer model of a purse seine.

During the second leg of the trip, staff from the Tuna/Porpoise Management Branch filmed fishing operations demonstrating approved porpoise-saving techniques. This footage will be used to produce a training film for porpoise observers and tuna boat skippers.

Installation of Super Aprons Continues

To obtain a permit to fish on porpoise during 1979, a purse seine vessel must install a super apron, a triangular extension of the net which changes the shape of the backdown channel and allows porpoise to escape the net more easily. Throughout this year, supervisory Fishery Biologist J. Coe and Fishery Methods and Equipment Specialists D. and Holts and R. Butler have assisted in the installation of super aprons and have overseen a trial set by each vessel in which an apron has been installed.

During the next month, a large number of installations are expected to be made in preparation for the fishing season that begins in January.

MARINE MAMMAL ASSESSMENT AND MONITORING PROGRAM

1979 Porpoise Population Survey Planned

Preparations for the 1979 aerial and ship porpoise population surveys are preceeding smoothly. Cruise leaders and observers have been tentatively selected and a contract for a four-engine amphibious aircraft has been signed. The PB4Y Innovator plane is being modified to allow better observation and attainment of greater offshore distances. Modifications are nearing completion and will be reviewed by the Office of

Aircraft Services and NMFS personnel. Plane and ship track lines are being finalized to allow a large degree of overlap between the area surveyed by the vessels and by the plane. Observations in a common area will allow calibration between the platforms for both the 1977 and the 1979 census efforts.

Dr. Eric Barham, Special Assistant to the Oceanic Fisheries Resources Division, and Lt. Cdr. Wayne Perryman of the NOAA Corps visited Bay St. Louis, Mississippi to examine nine-inch-square photographs of porpoise schools taken during the 1977 aerial flights. School size estimates are obtained by counting individual animals in the photographs using special photographic equipment available at the Mississippi Laboratory. Barham and Perryman will review existing methodologies and develop techniques to improve the 1979 photographic efforts. Additionally, SWFC aerial survey members, R. Holt, C. Oliver, T. Jackson and W. Perryman, have completed flights aboard Coast Guard helicopters to reacquaint themselves with procedures for operating cameras, spotting and identifying porpoise schools from the air, and estimating school size.

Porpoise Observer Data Bases Improved

All current and historical porpoise observer data bases have been converted from Data Management Language (DML) to Aladin Language. Immediate benefits include reduction of operating costs and the additional of report writing programs. Nearly all of the observer data from approximately 100 cruises in 1978 has been edited and placed on the observer data base.

As of 19 November, the cumulative average porpoise mortality estimated from data reported by observers at sea since the beginning of this year is 4.05 animals per porpoise set and 0.36 animals per ton of yellowfin tuna caught on porpoise.

Documentation Manual on Porpoise Mortality Nears Completion

A SWFC administrative report entitled, "Procedures for Monitoring Porpoise Mortality: Documentation manual" authored by Bruce Wahlen is nearing final form. The report is a "how to" manuscript concerning porpoise mortality monitoring.

Scientists Discuss Sperm Whale Catch

At the invitation of Richard Frank, NOAA Administrator and chief of the U.S. delegation to the International Whaling Commission (IWC), a special meeting of the Scientific Committee of the IWC was held at the Southwest Fisheries Center in La Jolla, California from

November 27 to December 8. Twenty-seven scientists from 11 nations attended the meeting to consider possible catch quotas for sperm whales in the north Pacific Ocean, but did not reach agreement on a specific quota.

At the meeting, scientists analyzed information concerning the abundance and harvest of sperm whales, provided by delegations from the two major whaling nations--Japan and the Soviet Union. Despite extensive computer analysis of the data available, the participating scientists could not agree on a specific catch to recommend to the Commission at their mid-December meeting in Tokoyo.

At the Commission's meeting in Tokyo, Japan, immediately following the La Jolla meeting, the Scientific Committee recommended that no female sperm whales be caught and that the catch of males should not exceed last year's catch of 5,105 in the North Pacific Ocean, but did not recommend a specific number of animals for harvest.

In 1978, the Commission set sperm whale quotas at 561 for Division 5 of the Southern hemisphere (an area from the equator to the Antarctic, and from 90° east longitude to 130° east longitude), and at 6,444 in the north Pacific Ocean. This year, the Commission agreed to eliminate sperm whaling completely in Division 5 and also voted to reduce the quota drastically in the north Pacific to 3,800 for 1979, a cut of more than 40%. The Commission further established a zero quota for female sperm whales in the north Pacific, although it did allow an accidental catch of slightly more than 400 females to be counted against the total quota.

Scientists participating in the Special Meeting on Sperm Whale Assessments of the Scientific Committee of the International Whaling Commission are shown above.

Left to right, standing: W. Bergmans, Netherlands; J.R. Beddington, United Kingdom; N. Argunov, U.S.S.R.; E. Mitchell, Canada; Y. Fukuda, Japan; T. Smith, U.S.; V. Zemsky, U.S.S.R.; M. Tillman, U.S.; R. Gambell, United Kingdom, Secretary to IWC; J. Bannister, Australia; D. Chapman, U.S., J. Valdivia, Peru; K. Radway-Allen, Australia; P. Best, South Africa; G. Kirkwood, Australia; G. Donovan, United Kingdom; J. Horwood, United Kingdom; R. Clarke, Mexico; R. Storro-Patterson, U.S.; M. Maeda, Japan; P. Spong, Canada.

Left to right, kneeling: S. Holt, UNEP; S. Ohsumi, Japan; J. Lomax, Australia; J. Gordon-Clark, United Kingdon; W. Perrin, U.S.; R. Borodin, U.S.S.R.

TIBURON LABORATORY

FISH COMMUNITIES INVESTIGATION

Strong 1977 Year Class Holds Promise of Enhancing Rockfish Catch in Coming Years

Estimates based on studies by the Fish Communities Investigation indicate that the 1977 year class of several important rockfish species has been very strong. The most important of these species are the brown rockfish, blue rockfish, and boccacio. The brown rockfish, which is a component of Bay Area partyboat catches, is an important item in the fresh-fish markets and restaurants of the local Asian community, where it commands a premium price. The blue rockfish is a very important catch of partyboats and independent recreational fishermen, while the bocaccio is the most important commercial species of rockfish in California.

Dr. William H. Lenarz, leader of the Rockfish Analysis Task, reports that recruitment of the 1977 year class has at least doubled the number of brown rockfish inhabiting the lab-dock study site. This year class first appeared in the area in September 1977, and now completely dominates catches. Data from samples of brown rockfish caught by commercial fishermen and partyboats indicate that the 1977 year class should start showing up in about 1981. Age at full recruitment into the fisheries remains unknown, because the sampling program has been underway only a short time, but available data suggest that full recruitment may not occur until as late as 1986.

Studies by Dr. Edmund S. Hobson and Tony Chess, of the Recreational Fish Communities Task, previously showed strong 1977 year classes for blue rockfish and other species at Mendocino, and California Fish and Game Biologists reported a strong 1977 year class for boccacio at Monterey. Based on sampling data, Lenarz estimates that blue rockfish of the 1977 year class will begin producing significant catches in 1981, but probably will not be fully recruited until 1983 or 1984. He also estimates that boccacio of the 1977 year class will be a significant part of the catch by 1980, but probably will not be fully recruited until 1982 or 1983.

It is expected that the 1977 year class will still be exceptionally numerous when it is fully recruited into the fisheries, but only further study will support or reject this hypothesis. If later rockfish catches show that the numbers of juveniles of a given year class appearing inshore during their first years can be used to foretell the relative numbers of that year class that later will enter the fisheries, then

management should find systematic sampling of juveniles in nearshore habitats to be an effective, yet inexpensive way to estimate future stock sizes. The ability to measure the relative size of a given year class several years before it enters the fishery would enable managers to adjust future plans accordingly.

New Perspective Gained on Hawaiian Coral Reefs

Hawaiian reefs have long been recognized as differing from most Indo-Pacific coral reefs in the absence in Hawaii of corals of the genus Acropora. Acropora spp. are the major scleractinian corals on coral reefs. The absence of Acropora in Hawaii generally had been assumed to stem from low water temperatures in that area.

This month a joint study of coral reef communities, led by Dr. Edmund Hobson, of Tiburon's Fish Communities Investigation, and Dr. Richard Grigg, of the Hawaii Institute of Marine Biology, found Acropora to be a major component of reefs at French Frigate Shoals in the Northwest Hawaiian Islands where water temperatures are considerably lower than on the major Hawaiian Islands. Though a few small isolated heads of Acropora had been seen at French Frigate Shoals in the Northwest Hawaiian Islands and a small colony was collected at the high Island of Kauai, there had been no evidence that these were significant elements of the fauna. The joint NMFS-HIMB investigation, however, found Acropora to be the dominant coral on some reefs, with individual heads reaching a size of up to 5 millimeters in diameter. The group also found the coral-feeding butterfly fish, Chaetodon trifacialis, a widespread Indo-Pacific form unrecognized as a member of the Hawaiian fauna, to be numerous in close association with these corals.

Blue-Lined Snapper May Be Displacing Goatfishes in Hawaii

The blue-lined snapper, Lutjanus kasmiri, introduced into the Hawaiian Islands about 20 years ago to enhance the nearshore fishery, is currently experiencing a population explosion. Dr. Edmund S. Hobson, who had been monitoring the fish communities at Kona since 1969, has noted possible effects of the sharp increase in this snapper.

Hobson observed this species only rarely during 15 months of intensive study in 1969 and 1970, but noted a small school residing in Honaunau Bay in 1974. Apparently, like many other snappers, this fish forms schools in established locations by day and disperses to feed at night. In 1974, it co-occurred by day with an aggregation of goatfish, Mulloidichthys vanicoelensis, which has a similar day-night activity pattern; goatfish had occupied this location alone in 1969-1970.

In 1977 and again this month, an immense school of blue-lined snappers occurred in Honaunau Bay, and only a few M. vanicoelensis were present. A large school of the closely related goatfish, Mulloidichthys flavolineatus, and a school of Parupeneus porpheneus, both of which were present at a nearby spot in 1969-1970 and in 1974, were absent in 1977 and 1978. At the same time, the number of goatfishes along a transect line on a neighboring reef, where the fishes have been monitored since 1969 (Table L), has decreased.

Table 1. Relative abundance (percent of individuals of all species) of goatfishes on a transect line at Honaunau, Hawaii, 1969-1978.

	1969	1974	1977	1978
Mulloidichthys flavolineatus	00.12	04.81	00.40	____
Parupeneus multifasciatus	00.58	01.60	____	00.32
P. bifasciatus	00.12	____	____	____
P. porphyreus	00.08	00.64	____	____
P. pleurostigma	00.04	____	____	____

Although the numbers involved in these counts are too small to carry much significance, they are consistent with the other observations, and warrant attention because the goatfishes have been an important component of Hawaiian reefs since ancient times. If nothing else, these data offer clues for direction of needed research. Significantly, many snappers and goatfishes world-wide have highly similar diets.

Researchers Investigate Perception of Bioluminescence by California Fishes

Dr. Edmund S. Hobson, leader of Tiburon Laboratory's Fish Communities Task, and Dr. William McFarland of Cornell University are investigating the possibility that fishes in California's kelp forests are adapted to perceive bioluminescence. In a manuscript still in early draft form, Hobson and McFarland present evidence that in many fishes the scotopic visual pigments, those used to see in dim light, are most sensitive to the wavelengths of light produced by luminescent plankton.

At night, movement underwater creates turbulence that stimulates highly visible luminescence among the plankton. Predator-prey interactions involve movement and, therefore, bioluminescence. Hobson and McFarland describe in their manuscript the enormous impact this circumstance has had on the tactics of both predators and prey, with supporting evidence from the nocturnal activities of California fishes.

Photos Aid in Identification of Rockfish Otoliths

Suzanne Pollock, a volunteer working with Fishery Biologist Tina Echeverria, has completed a series of photographs documenting the size, shape, and pattern of growth-ring formation in otoliths of 38 species of rockfish (Sebastes), which range from central California to Oregon.

Echeverria hopes to use the photos to determine which features on the otoliths can be used for identification of species; she can presently identify otoliths of some of the more important species and correctly identifies rockfish samples taken from catches of the recreational and commercial fisheries.

Though otoliths of some species are readily identified, separating closely related species such as Sebastes rosaceus and S. helvomaculatus, has proven more difficult. In such cases, it may be possible only to assign the otoliths to the group of closely related species.

FISHERIES DEVELOPMENT INVESTIGATION

Trips to Catch Shortbelly Delayed

Experimental fishing trips to catch shortbelly have been delayed until early next year because of unanticipated problems in refitting a fishing vessel. The vessel owner recently obtained a permit from California Department of Fish and Game to use a 1-1/4-inch mesh midwater trawl to catch shortbelly rockfish and squid.

Marketing of Rock Crabs is Successful

Despite the opening of the Dungeness crab season, the demand for rock crabs continued to be surprisingly high. As a result of the Tiburon Laboratory's research in experimental fishing and marketing of rock crabs, several fishermen in the Bay Area are presently marketing these animals, previously an unused by-catch of the Dungeness crab fishery.

Economist Ed Ueber and Fishery Biologist Sus Kato continued work involving the rock crab fishery. Walter Dahlstrom, California Department of Fish and Game, accompanied Ueber and Kato on one commercial fishing

trip to collect data pertinent to management regulations. Lieutenant Patrick Rutten of the NOAA Corps, who has also started working on the rock crab project, accompanied Ueber and Kato on a trip to the Johnson Oyster Ranch, Point Reyes, to set and retrieve pots.

Interest Shown in Euphausiids

The Tiburon Laboratory received several inquiries this month regarding availability of euphausiids in the U.S. Interested parties included domestic aquarium feed distributors, a catfish farmer, and a buyer from Belgium. Unfortunately, the laboratory's efforts to develop a fishery for euphausiids had to be put off several months ago when we lost our sole fine-mesh trawl.

Salmon Pen-Rearing Work Continues

Tagging and tag returns data from the 1976 release of king salmon are being processed for computer analysis. Examination of release sizes and return rates is planned. Studies of rearing costs for pen-raised salmon production continued during November and December.

Carlin tagging of the remaining 1,763 king salmon was completed during November, and the last fish released. A hole was found in the net which may explain the low number of fish remaining out of the 9,000 fish counted last August.

Gill net sampling produced 47 silver salmon in November, much more than in any previous November. No marked fish were taken in the net, but it is assumed from their size range that they are from the two releases in 1977. The sex ratio of returning coho salmon is significantly different this year with 39% females, compared to 11% and 18% in the previous 2 years. Scale samples have been taken from all fish, and a scale interpretation study is planned to provide better identifications of pen-reared, non-tagged fish.

As is usual for December, returns of salmon dropped off. Two silver salmon were gill netted at the laboratory, and six king salmon tags were returned from the Sacramento River system. Three of these were taken by spawning crews at Coleman and Nimbus Hatcheries.

During December, preliminary analysis was done on 125 returned tags from the 1976 release of king salmon. A relationship between size at release and recapture rate was revealed as follows:

Size at release (mm)	Percent of tags returned
112-200	3.1
201-211	4.1
212-220	7.5
221-310	7.6

Differences between recapture percentages were significant for all but the last two. It appears that, optimally, the fish should be reared to at least 212 mm before being released. However, the cost of rearing the fish rises exponentially with their growth. The cost per recaptured fish might bear a different relationship to size at release at 212 mm than at smaller sizes. Work on this concept is needed to define an optimum rearing system.

Anglers' Guide Goes into Second Printing

The Anglers' Guide to the U.S. Pacific Coast, which was first released by the Superintendent of Documents last March, went into a second printing this month. The new edition will include layout and errata corrections but no updating of information. The second run and binding of the 5,000 copies should be completed in early December. Cost to the public will remain $7.50.

This book, which describes marine game fish, fishing grounds and facilities along the United States Pacific Coast, is co-authored by James Squire of the La Jolla Laboratory and Susan Smith of the Tiburon Laboratory.

Angling Methods Manuscript Submitted

During the month, Susan Smith, Fishery Biologist, submitted the manuscript, "Changes in angling methods and tackle in California" for final typing. Work started on illustrations for the report.

PHYSIOLOGY INVESTIGATION

Adult Striped Bass Sampled

In the spring of 1978, large samples of adult striped bass were taken at the confluence of the Sacramento and San Joaquin Rivers during their upward spawning migration and after passing through Carquinez Straits. Sampling was done in cooperation with the California Department of Fish and Game, Anadromous Fish Branch at Stockton. Adult striped bass were also captured from June through November at the Tiburon Laboratory in cooperation with the Tiburon Laboratory salmon project.

A total of 73 pre-spawning fish and 75 post-spawning fish have been collected, and a number of parameters measured. Complete autopsies were performed and subsamples taken for various measurements. The purpose of this sampling was: 1) to determine the condition of parental fish just prior to spawning and to ascertain whether certain measures of parental condition correlated with measures of gametic viability, and 2) to identify factors which might relate to the annual "fish kill" of adult striped bass in the Carquinez Straits during the summer.

Sample analyses are proceeding. All data is being entered on coding sheets for key-punching and computer analysis. A total of 21 data sets are being prepared and include the following:

1) Field capture data,
2) Meristics-lengths, weight, age,
3) Color pattern definition,
4) Gonads-lengths, weights, fecundity, etc,
5) Autopsy data-liver, gall bladder, stomach contents, other organs,
6) Parasites and disease,
7) Histology-gonads,
8) Histology-other,
9) Chemistry-proximate analyses,
10) Chemistry-iron content in eggs,
11) Chemistry-pigments in eggs,
12) Pollutants-petroleum aromatic hydrocarbons,
13) Pollutants-pesticides (outside analyses),
14) Heavy metals (outside analyses),
15) Electrophoresis-transferrin, total serum proteins, LDH,
16) Blood-hemoglobin, erythrocyte, fragility, hematocrit,
17) Blood-red blood cells,
18) Blood-white blood cells, thrombocytes,
19) Blood-WBC: lymphocytes, monocytes, macrophages,
20) Blood-WBC: granulocytes,
21) Calorimetry-gonal eggs.

Complete results are not yet available, but preliminary measurements and observations indicate that both pre-spawning and post-spawning adult striped bass are heavily stressed by factors in addition to those due to natural spawning stress.

Age and fecundity estimates provided by the California Department of Fish and Game show that most of the pre-spawning fish were from 3 to 8 years of age, and, as expected, increasing fecundity is correlated with increasing age and body weight. Fecundity, however, was highly variable, ranging from approximately 100,000 to 1,000,000 eggs per female. Several large females had fecundities considerably below calculated regression curves.

During autopsies, abnormalities in skeletal structure were commonly found, including severe scoliosis, abnormal bone formation in the head and pug-headedness, abnormal fins and bent fin rays, and missing gill arches.

Internal organs often reflected considerable stress as well, primarily due to very heavy parasitic burdens. In a few cases, resorption of one or both ovaries was observed. In heavily parasitized fish, pressure necrosis of ovaries due to parasitic cysts occurred, and extensive visceral adhesions may have prevented normal spawning. Livers were also affected by pressure necrosis in some fish and were often smaller than expected for body length. Fat deposition in post-spawning fish was decreased in heavily parasitized fish; mesenteric fat and body weight were considerably lower than expected.

The parasitic assemblage varied between fish captured in relatively fresh water prior to spawning, and fish captured in the bay after spawning. Most parasites seem to be encysted larval worms and probably included larval nematodes, trematodes, and cestodes. External parasites were uncommon.

Examination of the blood cells also reflected a high degree of stress. Large numbers of phagocytic white blood cells are observed in many fish. The very low number of lymphocytes in both pre- and post-spawning females also indicated that the immune system of the fish had been affected.

A search for data and literature relevant to the possible effect of heavy industrial and municipal pollution in Carquinez Straits on these fish is underway. A meeting with several State water quality agencies, and the striped bass research group of California Department of Fish and Game is planned for December 7 to discuss this year's findings, to present our hypotheses, and to discuss a cooperative sampling program for next year.

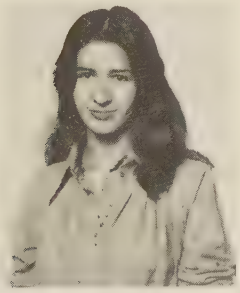
Bioenergetic Processes of Early Life Stages of Striped Bass Described

Work continued on a manuscript describing the bioenergetic process of the early life stages of striped bass. During the developmental period from fertilization to metamorphosis, embryos and larvae first obtain energy from endogenous sources contained in the yolk and oil. The transition to total dependence on exogenous energy, external food sources is gradual depending on the amount of food available to the organism. The manuscript describes this transition, along with the different rates and efficiencies of energy utilization, and compares the energy inputs of laboratory reared larvae with field animals.

Laboratory analyses of ovaries of spawning striped bass proceeded in November. Proximate analyses and caloric content measurements were made to test the hypothesis that condition of the adult spawner is related to viability and subsequent growth of the gametes.

Experiments showed the original amount of energy contained in the egg at fertilization influences the size of larvae up to the time of initial feeding and beyond, depending on the amount of food available to the larvae. To better understand these endogenous energy sources, chemical analyses are being made of eggs from females on their spawning migration and at spawning. Preliminary results indicate that eggs of fish at the time of spawning have fewer calories per unit weight, higher water contents, and higher ash contents than eggs in the earlier stages in maturing fish. Lipid contents of eggs from pre-spawning fish also were lower than fish at the time of spawning. These results would seem to indicate that chemical as well as morphological changes are taking place during the final stages of oocyte maturation.

RECENT ADDITIONS TO SWFC STAFF



EVELYN PORTILLO - EOD October 10, 1978

Illustrator - Administrative Services Division

VALERIE SPOWART - EOD July 11, 1978

Cash and Attendance Clerk - Administrative Services Division

PAT MURPHY - EOD October 1, 1978

Writer-Editor - Office of the Director

DE LORIS HOBBS - EOD October 22, 1978

Secretary - Oceanic Fisheries Resources Division

HONORS AND AWARDS

Honolulu Laboratory

The paper, "Age and growth of the nehu, Stolephorus purpureus (Pisces: Engraulidae), from the Hawaiian Islands as indicated by daily growth increments of sagittae," by Dr. Paul Struhsaker and James H. Uchiyama was nominated for recognition as the best publication appearing in the Fishery Bulletin in 1976. The paper was selected for Honorable Mention recognition by the NMFS Publications Policy Board.

Uchiyama is a Fishery Biologist in the Insular Ecosystem Study Task and Struhsaker was formerly a Fishery Biologist at Honolulu Laboratory.

La Jolla Laboratory

A paper written by Dr. William Perrin, James Coe, and James Zweifel, entitled "Growth and reproduction of the spotted porpoise, Stenella attenuata, in the offshore eastern tropical Pacific," was

selected as the most outstanding paper published in the U.S. Fishery Bulletin in 1976. Perrin leads La Jolla Laboratory's Marine Mammal Biology and Technology Program, Coe is a Supervisory Fishery Biologist in the program, and and Zweifel is a Mathematician in the Larval Fishes, Coastal East Pacific Program.

Nick Iorio, Computer Programmer, received a Master of Science degree in Computer Sciences from West Coast University.

The "Anglers' Guide to the United States Pacific Coast," authored by James L. Squire, Jr. and Susan Smith, fishery biologists at the La Jolla and Tiburon Laboratories, won a First Place Award in the Consumer Handbooks and Manuals category in the fifth annual Technical Publications Competition of the society for Technical Communication (STC) (Puget Sound Chapter). This publication is now eligible to compete in the International Technical Communications Competition sponsored by the STC.

Tiburon Laboratory

Dr. Edmund S. Hobson and James R. Chess, Fishery Biologists, won Honorable Mention for best publication in Fishery Bulletin in 1976 for their paper, "Trophic interactions among fishes and zooplankters nearshore at Santa Catalina Island, California," published in Vol. 74, No. 3.

PUBLIC RELATIONS

Honolulu Laboratory

On November 12, Richard Shomura, Director of the Honolulu Laboratory, appeared on a local TV show, "Let's go fishing," to discuss the Laboratory's fish aggregating buoy project. The host of the weekly one-hour shown is Bruce Carter, a prominent Honolulu sport fishing figure.

R. Uchida participated in a Career Day program at the Hawaii Baptist Academy talking with high school junior and senior students about careers in marine science during December.

La Jolla Laboratory

Dr. Tim Smith of the Marine Mammal Assessment and Monitoring Program gave a talk at Fullerton State on tuna/porpoise relationships and ecology during the week of November 6.

Tiburon Laboratory

On November 5, Tina Echeverria and Sus Kato presented movies and a display of Tiburon Laboratory's activities at the Annual Fishermen's Festival at Avila Beach, attended by an estimated 1,500 people. Informal discussions were held with fishermen and processors regarding possible joint research work.

Ed Ueber of the Tiburon Laboratory gave a short presentation on the future of the Bay Area fishery at a meeting of fishing industry spokesmen called by the Sausalito Planning Council on December 12.

Dr. Edmund S. Hobson, Tiburon Laboratory, will be featured on a Wild Kingdom episode which will have its premiere showing in February. The program was filmed in the Bahamas last summer and deals with the relationships between fishes and their environments. It will be shown according to the following schedule:

Los Angeles	Sunday, February 11	8:00 p.m.	KTLA
San Francisco	Sunday, February 11	6:00 p.m.	KRON
Honolulu	Sunday, February 11	4:30 p.m.	KHON
Washington	Saturday, February 17	12:00 Noon	WDCA
San Diego	Sunday, February 18	12:00 Noon	XETV

SEMINARS

Honolulu Laboratory

November 13 - Dr. Stephen Brandt, CSIRO, Division of Fisheries and Oceanography, Cronulla, NSW, Australia, spoke on "The effects of thermal fronts on fish distribution in Lake Michigan and the Atlantic Ocean."

14 - Professor Gordon Munro, Department of Economics, University of British Columbia, Vancouver, B.C., Canada, spoke on "Optimal management of transboundary resources."

La Jolla Laboratory

Beginning this month, Dr. Eric Barham, Special Assistant to the Oceanic Fisheries Resources Division, has the responsibility for organizing the bi-weekly seminar series. The format and subjects will remain essentially the same as last year. Responsibility for seminars in 1978 was the task of Fishery Biologist Charles O'Connell.

November 6 - Dr. Stephen Brandt of CSIRO, Australia, spoke on "Distribution of fishes near thermal fronts in Lake Michigan and the Atlantic Ocean."

21 - Fishery Biologist Gail Theilacker spoke on "Comparative larval anchovy (Engraulis mordax) morphology: live, laboratory preserved, and field collected," and Fishery Biologist John Butler spoke on "Rearing larval of coastal California fishes."

December 12 - Phillip Dustan of Scripps Institution of Oceanography presented the film "Mysteries of the Hidden Reef."

21 - Dr. Theodore Bullock, Professor of Neurophysiology at the University of California at San Diego, spoke on "The Rights of Animals: An Evolving Concept."

MEETINGS

November 6 - R. Shomura, Director of the Honolulu Laboratory, called a meeting to discuss a proposal for a state-wide fish aggregating buoy program. Participants from the State included Dr. Stanley N. Swerdloff and Kenji Ego, Henry M. Sakuda, and Alvin Z. Katekaru and Honolulu Laboratory staff members T. Otsu and H. Yoshida.

13-14 - Laboratory Director for Tiburon Laboratory, Norman J. Abramson, Fishery Biologist Sus Kato, and Economist Ed Ueber attended the Small-Scale Fishermen Workshop sponsored by NMFS Headquarters (Morton M. Miller and Michael K. Orbach) held at the Tiburon Laboratory. About 20 researchers and industry people convened to discuss problems associated with "small" fisheries.

16 - Roger Green, Daniel Ralph and Patrick Rutten of Tiburon Laboratory met with the management of the Feather River Hatchery and members of the Tyee Club to discuss plans for hatchery rearing and transporation of king salmon for next year's pen-rearing. The main experimental work will be on artificial chemical imprinting which will be started at the hatchery during the early life stages.

November 27 - December 8 - A special meeting of the Scientific Committee of the International Whaling Commission was held in auditorium of the La Jolla Laboratory.

November 28 - Kato and Ueber met with a fish processor and a food broker representing potential buyers of various fishery products, and discussed production of specialty "fast-food" dishes, use of waste products and underutilized species, and market potential of shortbelly rockfish. The processor, located at Fort Bragg, has agreed to handle the initial packing of whole frozen shortbelly for the Japanese market. Further experiments of products - to include surimi (minced flesh) will be delayed until catch rates, costs, and quality are determined.

29 - A meeting of the Center/Region Data Management Committee was held in the small conference room.

- Dr. J. Powers, Dr. W. Perrin, G. Nitta (SWR), M. Odemar and D. Miller (CF&G) met to discuss the State's proposal for joint work on the study of coastal pinnipeds. The study will emphasize delineation of pinniped interaction with fisheries and surveys to estimate population size for Optimum Sustainable Population (OSP).

30 - INP/CalCOFI meeting was held at the La Jolla Laboratory to review the further use and cooperation of the Mexican research vessel, Humboldt.

December 8 - Kato of Tiburon Laboratory visited Royal Seafoods in Monterey with a local exporter and a Japanese buyer. They discussed the feasibility of exporting small fish, the unused by-catch of trawlers, to Japan. Samples of various species of rockfish and flatfish were obtained from a trawler and shipped via air freight to Japan. Some of the fish, particularly the small flatfish, apparently have a ready market in Japan, while others need some promotion. Marketing trials of both fresh and frozen fish will commence in January.

11-15 - Dr. G. Sakagawa attended the negotiations for a new IATTC Tuna Convention in Costa Rica. Highlights of the Convention were as follows: there is no agreement at present. There will be another meeting January 15-19 in Mexico City of plenipotentiaries to map out a general framework for a convention.

There is general optimism within the State Department delegation that such a convention can indeed be achieved at the January meeting.

Several vital items and issues were laid out and discussed at the Costa Rica meeting. One of these was a guaranteed allocation for coastal states. The coastal states are asking for approximately 69% of the quota. The U.S. proposed 45%. As a compromise an offer for 57% was tabled at the meeting by the U.S., but, this was not accepted; therefore, the offer was withdrawn. The group agreed to a 15% incidental catch allowance during the closed season period. In principle, the group also agreed to the concept of an allocation for disadvantaged boats but the amount and wording is not clear yet. The last free trip concept is dead but the last open trip will be allowed to be completed at the close of the season. The fee schedule that has been proposed by Mexico-Costa Rica amounts to 2-1/2 times that which the U.S. originally proposed and seems to be unacceptable at this time. The U.S. industry has indicated its "bottom line position" to the negotiator, Ambassador Negroponte. There is great concern that an agreement be reached at the January meeting to prevent any major dislocations in the tuna fishery in 1979.

December 13 - A meeting was held at the Center to discuss possible joint research plans aboard a tuna purse seiner during 1979. Participating in the meeting were: Drs. W. Perrin and J. Powers, P. Jensen (NMFS, Washington, D.C.), R. Allen and J. Laake (IATTC), F. Alverson (LMR), B. Hofman and J. Prescott (MMC), and D. Burney (USTF). There will not be any additional vessel time available in the "Queen Mary" mode next year although the Foundation will help NMFS people to arrange for trips or to piggy back on work that the Tuna Foundation will be doing independently.

13-16 - Dr. R. Lasker attended the PROBES (Process and Rates of the Bering Sea Eco-System) meeting in Seattle and reported that the National Science Foundation polar program has committed about $880,000 for a year for PROBES including a larval fish component.

December 15 - The Marine Mammal Commission hosted a porpoise research program review at the Center. SWFC personnel from the Marine Mammal Assessment and Monitoring Program and the Marine Mammal Biology and Technology Program participated in the review. Items covered included personnel, funds, research results and future plans.

- Discussions were held with representatives of the National Ocean Survey on future SWFC vessel requirement needs. The combined needs indicated in the TDPs for 1980 are for 750 days ship time. Since the Cromwell and Jordan combined account for only 500 sea days, the point was made by representatives of the Coastal Division that the 120-footer now being built is essential to carry out planned research. Also strongly reiterated was the future need for a tuna seiner.

27 - A meeting was held at the Tiburon Laboratory with James Hall, representing Ranch Hand Foods. Hall is interested in the possibility of manufacturing surimi using shortbelly rockfish at his firm's plant in San Jose, where they already have some of the necessary equipment.

VISITORS

Honolulu Laboratory

November 7 - Dr. Takeshi Yasumoto from Japan and Dr. Y. Hokama, University of Hawaii visited Shomura to discuss ciguatera problems.

8 - Dr. Stanley N. Swerdloff, Project Manager, Hawaii Fisheries Development Plan, met with Shomura to discuss the State's Fishery Development Master Plan.

14 - Sarah Meltzoff, graduate student, Columbia University, visited Acting Director Tamio Otsu. Meltzoff has a grant from the Rockfeller Foundation to study the skipjack tuna fishery in the Solomons. She was at Honolulu Laboratory to talk to various staff members and to do a literature search.

November 14 - Dr. Salvatore Comitini, University of Hawaii and V. Soesanto from Indonesia visited Acting Director Otsu to discuss various local fishery problems.

16 - Dr. Peter Polomka, Office of National Assessment, Government of Australia, visited Otsu.

- Visitors from Seattle, Capt. Charles K. Townsend, Pacific Marine Center, National Ocean Survey, and Jerry Starrett, Northwest Administrative Service Office, briefed Shomura on the Kewalo lease negotiations with State officials.

17 - Otsu was visited by Francisco T. Laurel, Manila, Philippines, who is president of the company operating the purse seiner on which Fishery Biologist Walter Matsumoto recently spent some time observing the Philippines "payao" fishery.

December 11 - William Court, a graduate student doing squid research at the Tokyo University of Fisheries, visited Otsu.

28 - Mike McCoy, Director, Micronesian Maritime Authority, visited Otsu and Dr. Wetherall.

- Walter Bosworth and Harold Smither, former Purchasing Officer and Administrative Officer, respectively, visited with Honolulu Laboratory staff members.

La Jolla Laboratory

November 2 - R.W. Griffiths, G2 Consultants, Box 666, Pacific Palisades, California.

8 - Sarah Meltzoff, ICLARM.

9 - Al Zangri and Phil Symonds of Center for Natural Areas, Inc. visited the La Jolla Laboratory to present the first progress report on the Partyboat Passenger Survey.

15 - Chris Garrod, SIO.

16 - Linda Friedman and Diane Drew, TRW, Redondo Beach, CA.

17 - Richard Roberts, NOAA Administration, Rockville, MD.

20 - Richard Hamilton, the Motivators, San Diego.

November 20 - Margaret Bradbury, San Francisco State University.

21 - Jim Kelly, Greenpeace, San Diego.

27 - Dr. Claudio Barriga and Jaime Orreda Carada, Universidad del Norte, Antofagasta, Chile, S.A.

- Kevin Bailey, University of Washington, Seattle, WA.

- Doug Elliot, Pierce College, Woodland Hills, CA.

29 - Gary Smith, Southwest Regional Office, Nancy Wiley, Tiburon Laboratory, George Liao, Honolulu Laboratory, and Doug McLain of PEG visited the La Jolla Laboratory to attend the Center/Region Data Management Committee meeting.

- T. Mahony, CSC, Washington, D.C.

December 6 - Mike Richmond, Evening Tribune, San Diego, CA.

7 - Enrique Salerno, Ministerio de Comercio e Industrias, Panama, Republic of Panama.

11 - Fred Berry, SEFC, Miami, FL.

22 - Rich Wilson, Rich Wilson and Associates, Anchorage, Alaska.

28 - Robert Clark, Autononmous University, Ensenada, Mexico.

Tiburon Laboratory

November 3 - Robert W. Sharp, Frederickson & Kamine Consultants, Sacramento, CA.

- Serge Doroshov, University of California, Davis

- John Carnacchia, University of California, Davis

- Marvin Jung, California State Water Resources Divison of Planning, Sacramento, CA.

9 - Shojiro Ichimaru, Imports and Exports, Japan

- Isao Kato, Imports and Exports, Saratoga, CA.

8 - Richard Condit, California Regional Water Quality Control Board, San Francisco Bay Region.

November 13 - Barbara Katz, Sea Grant Marine Advisory Program, Wilmington, CA.

- Wes Silverthorne, NMFS, Terminal Island, CA.

- Morton M. Miller, NMFS, Washington, D.C.

- Carlos Montero, University of California, San Diego, CA.

- Shari Grass, United Fishermen of Alaska, Juneau, AK.

- Biliana Cicin-Sain, NOAA Policy and Planning, Washington, D.C.

- Bruce W. Norman, NMFS, Washington, D.C.

- Court Smith, Oregon State University, Corvallis, OR.

- Mel Greenwood, NWAFC, Seattle, WA.

- Jon Rowley, Ketchikan, AK.

- Rosita Worl, University of Alaska, Anchorage, AK.

- William Jensen, Lewis & Clark College, Portland, OR.

- Mr. and Mrs. Les Clark, Columbia River Fishermen's Protective Union, Chinook, WA.

- Kenneth C. Peterson, Washington Kelpers Association, Tacoma, WA.

- George W. Rogers, University of Alaska, Juneau, AK.

- Gail Willette, NMFS, Washington, D.C.

- Anthony Vasko, Bethel, AK

- Michael K. Orbach, NMFS, Washington, D.C.

- Steve Langlon, University of Alaska, Anchorage, AK.

- Zeke Grader, Pacific Coast Federation of Fishermen's Association, Sausalito, CA.

- Rune Swedburg, Swedo Pump Company, San Francisco, CA.

15 - Dick Heimann, California Department of Fish and Game, Sacramento, CA.

- Jerry Lukas, Department of Fish and Wildlife, Newport, OR.

November 15 - Tom Northup, Washington Department of Fisheries, Montesano, WA.

16 - Richard S. Caldwell, Oregon State University, Newport, OR.

- Wayne A. Clark, O.S.U. Marine Science Center, Newport, OR.

- Darrell E. Ward, Oregon State University, Newport, OR.

- Frank Viollis, San Francisco State, San Francisco, CA.

20 - Dr. Michael Josselyn, San Francisco State, San Francisco, CA.

21 - Kim Baughman, Sea Urchin Enterprises, Moss Beach, CA.

- Bill Cate, Sea Urchin Enterprises, Moss Beach, CA.

27 - Dr. Jon Cooper of Texas Instruments Corporation, Buchanan, New York, met with striped bass task members.

28 - Dr. Jon C. Cooper, Texas Instruments, Buchanan, NY.

29 - Dr. Richard H. Parrish, Pacific Environmental Group, Monterey, CA.

December 6 - Jim Butler, San Francisco State University, San Francisco, CA.

- Leo Dunne, San Francisco State University, San Francisco, CA.

7 - Richard Condit, Regional Water Quality Control

- Orrin Deland, San Francisco State University, San Francisco, CA.

- David W. Kohlhorst, California Department of Fish and Game Stockton, CA.

- Erwin Seibel, San Francisco State University, San Francisco, CA.

- Ed Simons, California Department of Fish and Game, Yountville, CA.

December 7 - Don Stevens, California Department of Fish and Game, Stockton, CA.

12 - Chuck Burgess, "The Sea of Cortez" Restaurant Design Associates, Sausalito, CA.

- Wayne Orth, Nome, AK.

18 - Steve Ralston, University of Washington, Seattle, WA.

19 - Bob Ritchie, Alaska Biological Research, Fairbanks, AK.

21 - Haole Makahiki Hou, NMFS, Honolulu Laboratory, Honolulu, HI.

22 - David Hoagland, Oregon State University, Corvallis, OR.

27 - Jim Hall, Ranch Hand Foods, Fremont, CA.

- Peter Hunnigh, University of Utah, Salt Lake City, UT.

- John Klein, Novato, CA.

Pacific Environmental Group

November 11 - Jim Ingraham, NWAFC, Seattle, WA.

TRAINING

Maureen Woods, Susan Covey and Hazel Nishimura, Librarians, attended the 1978 Federal Agency Field Librarian Workshop in Washington, D.C. from October 29 to November 3.

Catherine Hurst, Administrative Clerk at the Tiburon Laboratory, received training in Federal Travel Regulations at CSC from November 13 to 15.

Maxwell Eldridge, Fishery Biologist at the Tiburon Laboratory, attended a Supervision and Group Performance Course in La Jolla from November 13 to 17.

Dr. W. Perrin, leader of La Jolla Laboratory's Marine Mammal Biology and Technology program, attended a Personnel Management Course in Washington, D.C., from October 29 to November 4.

J. Coe, Supervisory Fishery Biologist at the La Jolla Laboratory, attended a course in Personnel Management for EEO Staffs in Las Vegas, Nevada, from October 30 to November 2.

B. Remington, J. Powers and J. Hunter attended the Supervisory and Group Performance training session held in La Jolla.

Dr. Reuben Lasker, leader of the Coastal Fisheries Resources Division at the La Jolla Laboratory, attended a computer training course from November 27 to December 1.

S. Covey, Biological Technician at the La Jolla Laboratory, received training in subject searches and strategies on DIALOG at Lockheed in Palo Alto, from December 4 to 6.

PERSONNEL ACTIONS

November 20 - Donald Burns, Biological Aid; Candy Cooperrider, Biological Technician; and Janet Mason, Biological Aid; Temporary Appointments - Tiburon Laboratory.

21 - Carol Sanchez, Fishery Biologist, Name change to Kimbrell - La Jolla Laboratory.

25 - Jeffrey Polovina, Statistician, termination of 1-month appointment - Honolulu Laboratory.

27 - Deanne Olson, Student Appointment - La Jolla Laboratory.

December 3 - Scott Johnson, Biological Technician; Paul Ritchie, Biological Technician; William Brinkerhoff, Biological Technician; Reassignments - La Jolla Laboratory.

- William Fox, Research Fishery Biologist, Transfer to SEFC - La Jolla Laboratory.

- Jacqueline Coit, Administrative Assistant, Title Change - La Jolla Laboratory.

- Bert A. Kikkawa, Biological Technician (Fisheries), Promotion - Honolulu Laboratory.

5 - David Bratten, Biological Technician, Resignation - La Jolla Laboratory.

13 - Kathleen M. Fourre, Biological Aid, Termination - Tiburon Laboratory.

17 - Daniel E. Ralph, Fishery Biologist, Promotion - Tiburon Laboratory.

18 - Daniel R. Fehr, Biological Aid, Temporary Appointment - Tiburon Laboratory.

December 18 - Lee Inness-Brown, Student Assistant, Temporary Appointment - La Jolla Laboratory.

26 - James Cotton, Biological Technician; Gary Friedrichsen, Biological Technician; Phillip Unitt, Biological Technician; Robert Pitman, Biological Technician; Temporary Appointments - La Jolla Laboratory.

30 - Mark Cohen, Student Appointment - La Jolla Labortory.

31 - Michael Deerman, Gene Anderson, Thomas Duffy, and Darrell Lee, Biological Technicians (Fisheries), Promotions - La Jolla Laboratory.

UNITED STATES
DEPARTMENT OF COMMERCE

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